Divided Attention in Multitasking with Mobile Devices

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Background

-Ubiquitous mobile technology increasingly allows for situations that divide individuals' attention across more than one task. These situations include walking, driving, watching a lecture, or watching television. According to the Neilson Cross Platform Report (2012), 40% of tablet/ smartphone owners use their phone while watching TV.

-Cook and Jones (2011) found that 74.3% of young adults reported texting and driving, 51.8% do so on a weekly basis, and 16.8% reported accessing the web while driving. They also found a positive correlation between cell-phone behavior, crashes, and traffic citations.

-Ophir, Nass, and Wagner (2009) demonstrated that self-reported heavy media-multitaskers performed worse than light media-multitaskers in a multitasking paradigm.

-These findings show that people are interacting with mobile technology in a novel spatial configuration while simultaneously performing other tasks, and that experience with this scenario does not improve performance.

Aim

Determine whether screen size of a mobile device affects performance of a foreground or background task during a dual-tasking paradigm.

Studies

-Experiment 1: Compare phone and tablet conditions during a dual-tasking paradigm for differences in relative dual-task cost (DTC).
-Experiment 2: Control for haptic and proprioceptive elements of device weight and dimensions by adding a 3rd condition.

Methods

Experiment 1

Participants

46 participants (33 female,13 male)

Materials and Procedure

Participants were divided into conditions where they balanced a blue ball within a target circle on either a phone or a tablet. On the background screen participants vocally responded to the position of a change in the direction of 1 out of 4 arrows (see Figure 1).

Experiment 2

Participants

123 participants, (87 female,36 male)

Materials and Procedure

The same tasks were performed, but participants were now divided randomly between a phone, tablet and phony tablet condition (see Fig. 2).

Tasks

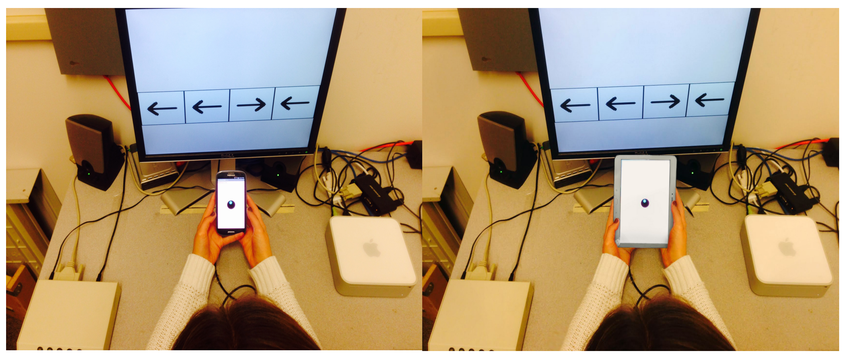

Figure 1. Mobile device foreground and computer display background task example with the phone and tablet conditions for Experiment 1.

Figure 2. Mobile devices for the foreground task with the phone, phony tablet, and tablet conditions from left to right for Experiment 2.

Experiment 1 Results

Measure: Reaction Time and accuracy were recorded for the background task while a deviance error score was calculated for the foreground task by device condition.

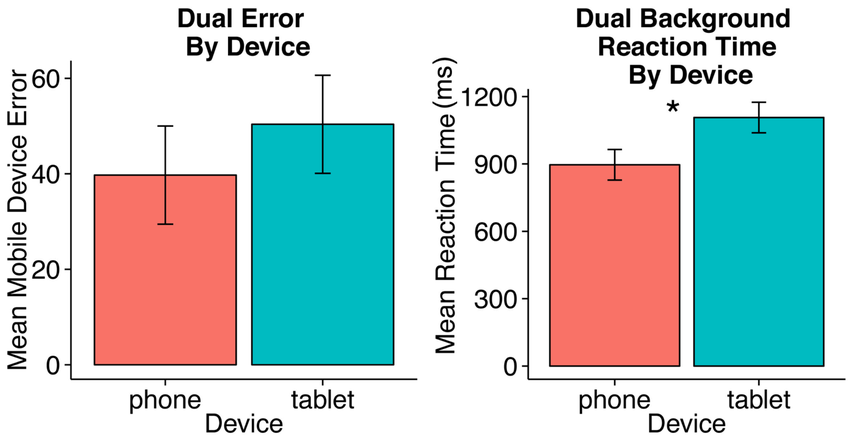

Figure 3. Error score by mobile device and background reaction time by mobile device during dual-tasking.

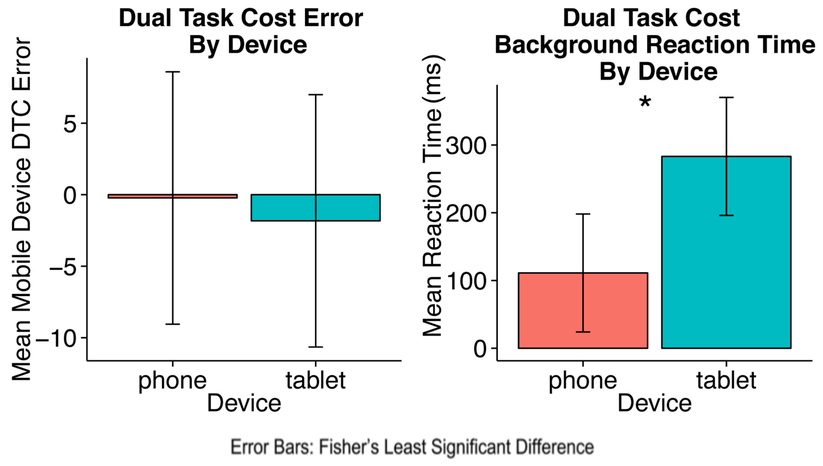

Figure 4. DTC Error score by mobile device and DTC background reaction time by mobile device calculated by subtracting the single task from the dual task for each condition.

Experiment 2 Results

Measure: Reaction Time and accuracy were recorded for the background task while a deviance error score was calculated for the foreground task by device condition.

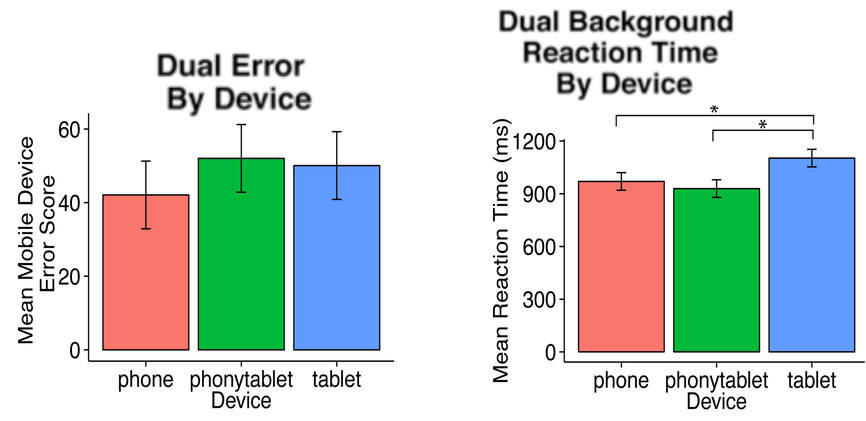

Figure 5. Error score by mobile device and background reaction time by mobile device during dual-tasking.

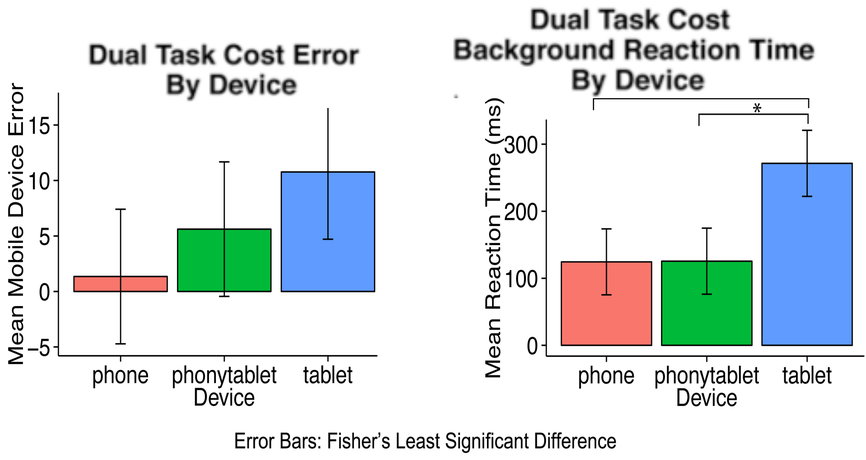

Figure 6. DTC Error score by mobile device and DTC background reaction time by mobile device calculated by subtracting the single task from the dual task for each condition.

The results of Experiment 1 demonstrate that there may be an effect of screen size on ability to attend to the background task such that a larger screen increases reaction time to the background stimulus onset. Experiment 2 suggests that this effect of screen size is primarily visual as opposed to haptic or proprioceptive by equating the weight and dimensions of the tablet with the screen of the phone in the phony tablet condition.

Conclusion & Application

Participants perform similarly on keeping the blue ball within the target on either device regardless of its size. However, larger screens decrease performance to the background task. This effect is persistent when controlling for screen resolution and the weight and dimensions of the device. This finding has implications for:

- Cognitive load of larger mobile devices in everyday life
- Larger screen laptops in lectures and talks
- Larger Screens in vehicles

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